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IS 5896 (Part 1) (1970, Reaffirmed 2010): Code of Practice for Selection, Operation and Maintenance of Special Fire Fighting Appliances, Part 1: Combined Foam and CO2 Crash Tender. UDC 614.845.6



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IS : 5896 (Part I) - 1970

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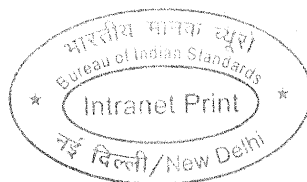
Indian Standard

CODE OF PRACTICE FOR
SELECTION, OPERATION AND MAINTENANCE
OF SPECIAL FIRE FIGHTING APPLIANCES

PART I COMBINED FOAM AND CO₂ CRASH TENDER

(Third Reprint MARCH 1997)

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BUREAU OF INDIAN STANDARDS

MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG

NEW DELHI 110002

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May 1971

*Indian Standard*CODE OF PRACTICE FOR
SELECTION, OPERATION AND MAINTENANCE
OF SPECIAL FIRE FIGHTING APPLIANCESPART I COMBINED FOAM AND CO₂ CRASH TENDER

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Indian Standard

CODE OF PRACTICE FOR SELECTION, OPERATION AND MAINTENANCE OF SPECIAL FIRE FIGHTING APPLIANCES PART I COMBINED FOAM AND CO₂ CRASH TENDER

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 26 October 1970, after the draft finalized by the Fire Fighting Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 Even the best designed equipment will not serve the purpose for which it is intended unless it is correctly employed and operated and adequately and regularly maintained. This fact assumes greater significance for equipment which is meant for special use or application. Combined foam and CO₂ crash tender is one such equipment.

0.3 There are several makes of combined foam and CO₂ crash tenders, both imported and indigenous, in use at aerodromes in India. Whereas, the general principles for the selection, operation and maintenance of all such appliances are the same, details vary. The recommendations in this standard have been framed particularly for the combined foam and CO₂ crash tender made to IS:951-1969*.

0.4 Provisions of IS:951-1969* have not been discussed in this standard. It is, therefore, necessary to make a reference to that standard while using this.

0.5 No fire fighting appliance can be operated without adequate manpower and extinguishing media. Recommendations for these have, therefore, also been included in this standard.

0.6 These recommendations take into account the recommendations of the International Civil Aviation Organization as far as possible, but are not exhaustive. These, however, cover most of the essential requirements. Any situation not covered by these recommendations may be dealt with according to normal fire service practice and procedures.

*Specification for combined foam and CO₂ crash tender (*first revision*).

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0.7 This code of practice represents a standard of good practice and, therefore, takes the form of recommendations.

0.8 In the formulation of this standard, due weightage has been given to international co-ordination among the standards and practices prevailing in different countries in addition to relating it to the practices in the field in this country.

0.9 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS:2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard lays down the recommended practice and procedures for the selection, operation and maintenance of combined foam and CO₂ crash tender conforming to IS:951-1969†.

2. SELECTION

2.1 The combined foam and CO₂ crash tender shall be provided at aerodromes, primarily for fighting fires in aircraft and petroleum, where foam is intended to be used as the principal fire extinguishing medium. It may also be used for fighting Class A fires (*see* IS:2190-1962‡) or for cooling down, as necessary, in addition to its primary function of fighting fires in aircraft and petroleum.

NOTE 1 — The main purpose of providing this type of appliance at an aerodrome is to render immediate attack on an aircraft fire possible in the event of an accident, which includes all fires in aircraft — whether as a result of crash or otherwise. It is, therefore, essential that it is not diverted for fighting fires other than aircraft fires if an aircraft emergency (*see* Appendix A) is in existence at the time of such incident, unless appliances of this nature are available which are in excess of immediate requirements.

NOTE 2 — The amount of carbon dioxide carried on this appliance is not adequate by itself to fight a large aircraft or petroleum fire in the open. Its use is restricted to extinguishing small pockets of fires after the main body of fire has been suppressed by foam and to fighting fires inside the fuselage, engines or wing spaces of aircraft.

NOTE 3 — These appliances are not suitable when the ambient temperature goes below the freezing point of water during any part of the year. Large capacity and high discharge rate dry powder tenders are recommended for such aerodromes. These may, however, be used under exceptional circumstances at aerodromes where the ambient temperature does not fall below -5°C at any time of the year, provided a suitable anti-freeze is added to each refill of water in the crash tender tank and radiator tank.

*Rules for rounding off numerical values (*revised*).

†Specification for combined foam and CO₂ crash tender (*first revision*).

‡Code of practice for selection, installation and maintenance of portable first-aid fire appliances.

3. SCALE

3.1 Combined foam and CO₂ crash tenders shall be provided according to the scale recommended in Appendix B for different categories of aerodromes.

4. HOUSING

4.1 Crash tenders shall be housed in properly designed fire stations at suitable locations at the aerodrome to ensure:

- a) adequate protection from the ravages of weather,
- b) adequate facilities for in-service maintenance, and
- c) speedy turn-out to any possible incident at the aerodrome or its immediate vicinity.

4.2 Crash tenders shall not be left standing in the open except for the duration of standbys (*see* Appendix A) or actual usage for drills or operational purposes.

5. MANPOWER

5.1 A crew of four or six trained men, according to service conditions, shall be provided to man each appliance. The crew shall comprise one officer-in-charge of the appliance, one fire operator (fireman), driver and two or four fire operators (firemen). When no separate rescue tender is provided, necessary extra men may be provided for the crew of this appliance for rescue work.

NOTE 1 — Training should include complete familiarization with the appliance—its capabilities, operation and maintenance, emergency procedures, fire-fighting techniques and complete familiarization with the topography of the aerodrome and its vicinity, including all approach and access routes.

NOTE 2 — The strength of crew recommended in 5.1 is the normal complement required to man the appliance efficiently for fire fighting operations. In an emergency, the appliance can be operated by reduced number of men, but its effectiveness will be reduced. The recommended strength does not include the requirements of manpower for rescue operations.

5.2 It shall be ensured that the full crew recommended in 5.1 is available for instantaneous turn-out at all times when the appliance is required.

6. WATER SUPPLY

6.1 Adequate water supply shall be provided to enable each crash tender to be operated for a continuous period of five minutes, without interruption, delivering its full rated output of foam.

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6.1.1 Additional water supply for the purpose of **6.1** shall be carried on large capacity water tenders conforming to the 'Indian Standard specification for water tender, type X, for fire brigade use' (*under preparation*).

NOTE — Until the standard under preparation is published, the matter shall be subject to the agreement between the concerned parties.

6.1.2 Each water tender shall be manned by its full complement of crew who shall be available for instantaneous turn-out at all times when the water tender is required to augment the water supply on the crash tender.

6.2 Water supply for fighting fires in static risks, like the hangars, workshops, electric sub-stations, oil companies, depots, aircraft parked on aprons, airport terminal and other buildings, etc, shall be provided in the form of water stored in static tanks.

6.2.1 The static tanks shall be designed and sited to ensure that:

- a) the capacity of each tank is adequate to allow simultaneous and continuous pumping by two fire appliances, each drawing 3 200 l/min of water, for at least 30 min ;
- b) there are adequate arrangements for the initial filling and speedy replenishment of each tank, so as to ensure that an empty tank can be filled up in not more than 18 hours;
- c) no tank forms an obstruction or accident hazard to aircraft, surface vehicles and men; and
- d) no tank shall be more than 100 m away from the risk it is intended to cover. For high fire risks, like oil companies' depots and hangars, the siting of static tanks should not be less than 50 m away from the risk to be covered.

6.3 In addition to the provision of additional water supply recommended in **6.1** and **6.2**, an overhead reservoir shall be provided for quick filling of crash tender water tank.

6.3.1 The design of the overhead reservoir shall be as shown in Fig. 1.

6.3.2 The capacity of the overhead reservoir shall be adequate to provide at least two complete refills for all fire fighting appliances fitted with a water tank at the station.

6.3.3 The overhead reservoir shall be sited at a suitable location which shall keep running distance of vehicles requiring replenishment to the minimum and the reservoir itself shall not form an obstruction or accident hazard.

NOTE — It may be necessary to build the overhead reservoirs at more than one site to achieve this at large aerodromes.

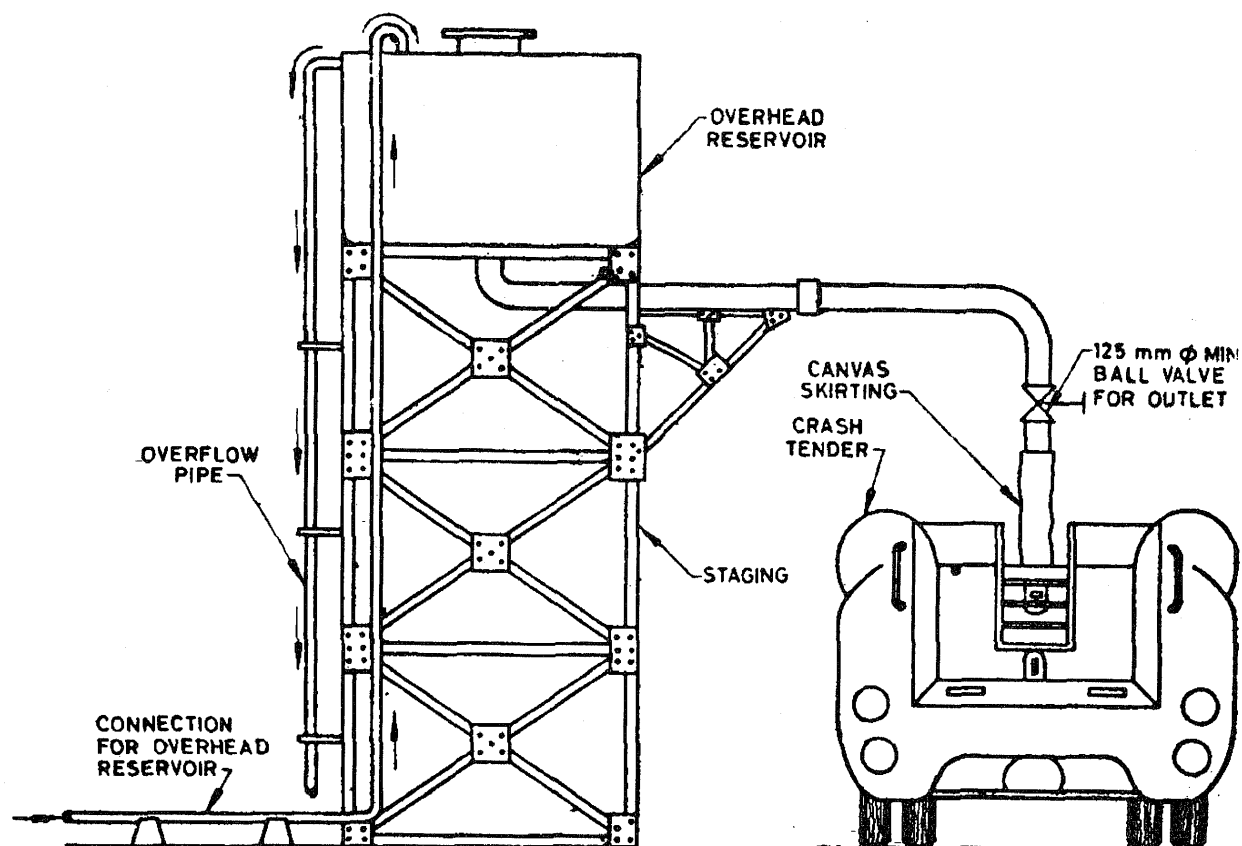


FIG. 1 TYPICAL ARRANGEMENT FOR QUICK REFILLING OF CRASH TENDER WATER TANK

6.3.4 There shall be adequate arrangements for the initial filling and speedy replenishment of each overhead reservoir and necessary approach road and hard-standing shall be provided to enable the heavy crash tender to draw water from it.

7. ADDITIONAL FOAM-COMPOUND SUPPLY

7.1 Additional supplies of foam-compound, conforming to IS:4989-1969* shall be provided for replenishing the foam-compound tank on the crash tender and arrangements shall be made for its speedy transport to the required site.

7.2 The total amount of additional foam-compound provided for each crash tender shall be adequate for two complete refills of its foam-compound tank.

*Specification for foam-compound for producing mechanical foam for fire fighting.

8. SPARE CO₂ CYLINDERS

8.1 one or more spare sets of CO₂ cylinders, conforming to IS: 2872-1967* fully charged with CO₂ gas conforming to IS: 307-1966†, shall be provided for each crash tender.

NOTE — The number of spare sets to be provided for each crash tender will depend upon the availability of recharging facilities for the cylinders. In cities where such facilities are available, only one spare set per crash tender may suffice. Where the cylinders are required to be transported to a considerable distance for recharging at least two spare sets of cylinders per crash tender are recommended.

9. SPARE PARTS

9.1 Adequate spare parts for the maintenance of the chassis, engine pump, foam producing and carbon dioxide equipment and radio-telephone shall be provided at each station. This is particularly necessary for stations where spare parts are not readily available.

10. ACCESS ROADS

10.1 For a foam and CO₂ crash tender to be effective in fire extinguishing and aiding rescue operations from a crashed aircraft, it should be able to reach the crash site as expeditiously as possible. This can be partly achieved by the judicious siting of the fire stations (*see 4.1*). Local topographical conditions at an aerodrome may, however, require means to assist in the fulfilment of this essential requirement. Suitable quick exits shall, therefore, be provided around the perimeter of the aerodrome for rescue and fire fighting vehicles and good approaches to access roads beyond the aerodrome boundary for, as far a distance as practicable, shall also be provided.

11. OPERATION

11.1 The foam and CO₂ crash tender may be operated for any of the following:

- a) Production of foam, taking water from the service tank of the crash tender;
- b) Production of foam and delivery of foam-fog, taking water from the service tank of the crash tender;
- c) Delivery of water jets or water-fog, taking water from the service tank of the crash tender;
- d) Using the first-aid hose-reel only, taking water from the service tank of the crash tender;

*Specification for low carbon steel cylinders for the storage and transportation of liquefiable gases.

†Specification for carbon dioxide (*second revision*).

- e) Continuing any of the operations (a) to (d), without interruption, taking water from the water tender;
- f) Production of foam, taking water from an open static supply;
- g) Production of foam ~~and~~ delivery of foam-fog, taking water from an open static supply;
- h) Delivery of water jets or water-fog, taking water from an open static supply;
- j) Filling the water tank of the crash tender;
- k) Filling the foam-compound tank of the crash tender; and
- m) Discharging carbon dioxide gas for extinguishing small fires. The correct operation for each of the above is explained in 11.2 to 11.13.

11.2 General—The following shall be checked at the beginning of each tour of duty by the incoming crew:

- a) *Water Tank* — It shall be kept full.
- b) *Foam-Compound Tank* — It shall be kept full and the air-vent kept clean.
- c) *Engine Radiator Tank and Auxiliary Tank for the Heat Exchanger, Where Fitted* — These shall be kept full.
- d) *Fuel Tank* — It shall be kept full.
- e) *Tyres* — These shall be checked for correct inflation. The correct pressure given in the instruction manual for the chassis shall be painted on the outside of mudguards, above the tyres, in white paint, so as to ensure correct and ready means for checking.
- f) *Oil Level in Engine Sump* — It shall be up to the mark for correct level on the dip stick.
- g) *Battery* — It shall be topped up with distilled water and the specific gravity of the electrolyte shall be checked. Connections between the battery terminals and the electrical circuit shall be checked to ensure that these are tight.
- h) *Carbon Dioxide Equipment* — The carbon dioxide hose-reels shall be checked to ensure that these rotate freely and the hose is correctly wound. The pull-off handles in the driver's cabin shall be checked to ensure that these are not already pulled out. The connection at each carbon dioxide cylinder head shall be checked to ensure that it is correctly made and that the safety peg is out.

- j) *First-Aid Hose-Reel*—The first-aid hose-reel shall be checked to ensure that it rotates freely and that the tubing is correctly wound. The tubing shall be kept filled with water up to the shut-off nozzle and the nozzle kept shut.
- k) *Ancillary Equipment*—It shall be checked with the inventory lists for correctness of quantity and stowage.

11.2.1 The engine shall be started to ensure that it is capable of starting instantaneously and shall be run up for five minutes at the beginning of each tour of duty by the incoming crew. All lights, bells and flashing beacon shall also be checked at the same time.

NOTE—It is desirable that the appliance is taken out on a road run along taxi-ways, apron, runway, etc, during the running up period and its brakes and running checked at the same time. Necessary precautions shall be taken while using the taxi-ways and/or the runway for this purpose and prior clearance of the aerodrome control tower shall be sought for using these.

11.2.2 A test call shall be given to the fire station watch room and the aerodrome control tower over the radio-telephone to ensure that its transmission and reception are both clear.

11.2.3 The trickle charger on the appliance shall be kept connected to the electric mains when the appliance is parked in the appliance day.

11.2.4 While fighting an aircraft fire, the appliance shall be parked on the upwind side of the burning aircraft, that is, it shall be kept out of the way of the billowing smoke. The appliance shall, however, be sited as close to the aircraft on fire as possible. The exact location of the crash tender and position of foam jets, *vis-a-vis* the burning aircraft depend upon various factors, like the intensity of fire and extent of the fire-zone, the number and type of appliances available for fire fighting, etc. Figures 2 and 3 illustrate some of the ways in which this can be done. These are only representative and do not cover all situations.

NOTE—It is not the intention to go into the details of aircraft fire fighting techniques here, but siting of appliance and jets has an important bearing on the effectiveness of operations. Hence, it is included here.

11.2.5 In addition to the instructions for various operations given in 11.3 to 11.13, the following general instructions shall be borne in mind while running the engine or operating the pump:

- a) When the engine has to be run stationary for long duration, either by itself or for pumping, the bonnet shall be opened to allow cool air to circulate round the cylinder block to assist cooling. In vehicles having forward driving control, all windows and doors of the driving cabin shall also be opened.
- b) The driver operator shall take all possible care while opening the valves and building up pressure in the hand-line(s).

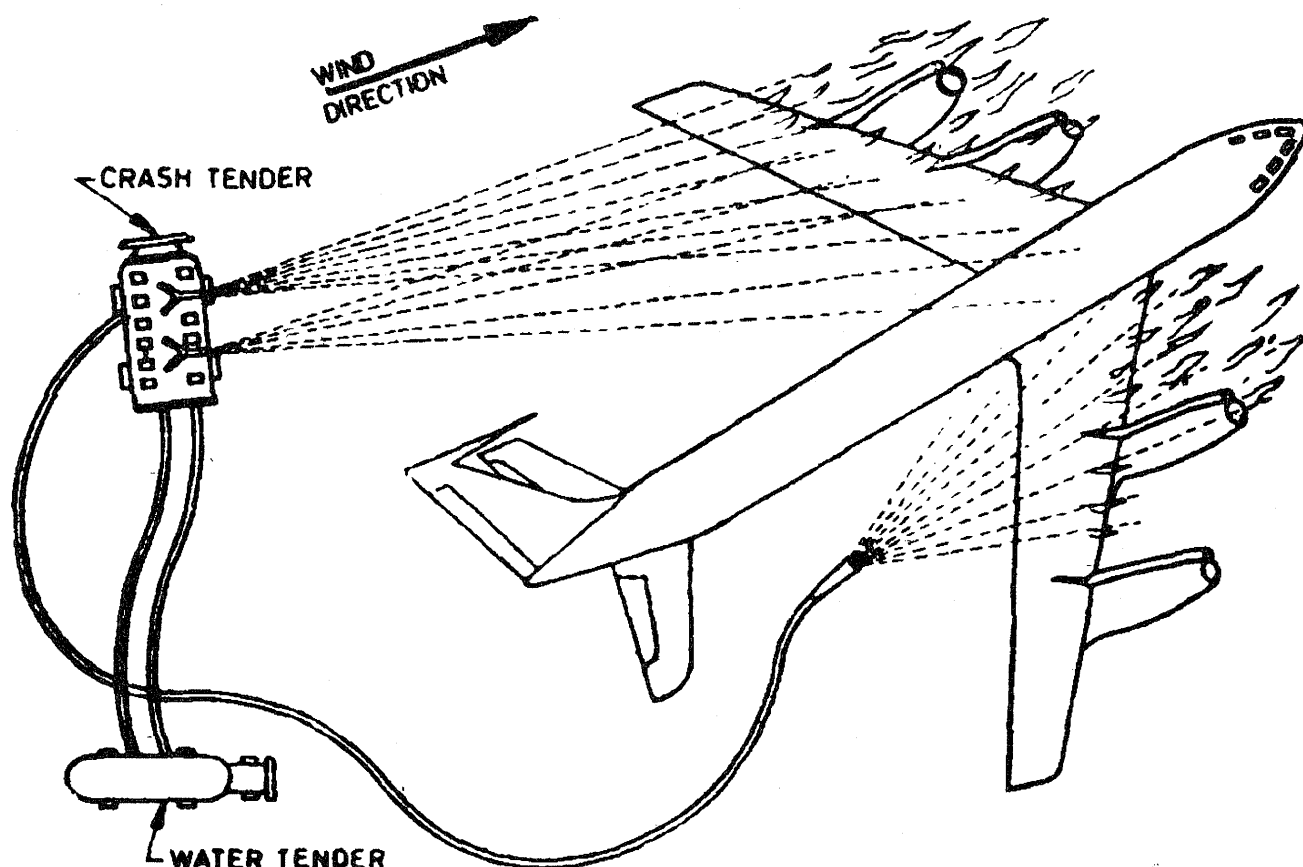


FIG. 2 TYPICAL SKETCH SHOWING CORRECT PARKING OF APPLIANCES IN RELATION TO BURNING AIRCRAFT (ONE FOAM AND CO₂ CRASH TENDER AND ONE WATER TENDER)

- c) The monitor(s) shall be handled with due care even when no foam is passing through these, because a sudden discharge through the monitor may cause it to be thrown up and may result in injury to the operator.
- d) All pump and engine gauges shall be kept under constant watch and prompt action shall be taken to trace and/or rectify the fault if any gauge shows an unusual reading.
- e) The pump gland shall be examined from time to time and adjusted as required.
- f) Water tender shall always be connected to the crash tender when using water from the crash tender service tank. It can be disconnected later if not required.

11.3 Production of Foam, Taking Water from the Service Tank to the Crash Tender—This operation may be necessitated when fighting fire in spilled fuel, oil companies' depot and/or aircraft, or when carrying out routine drills at the fire station. It may also be required

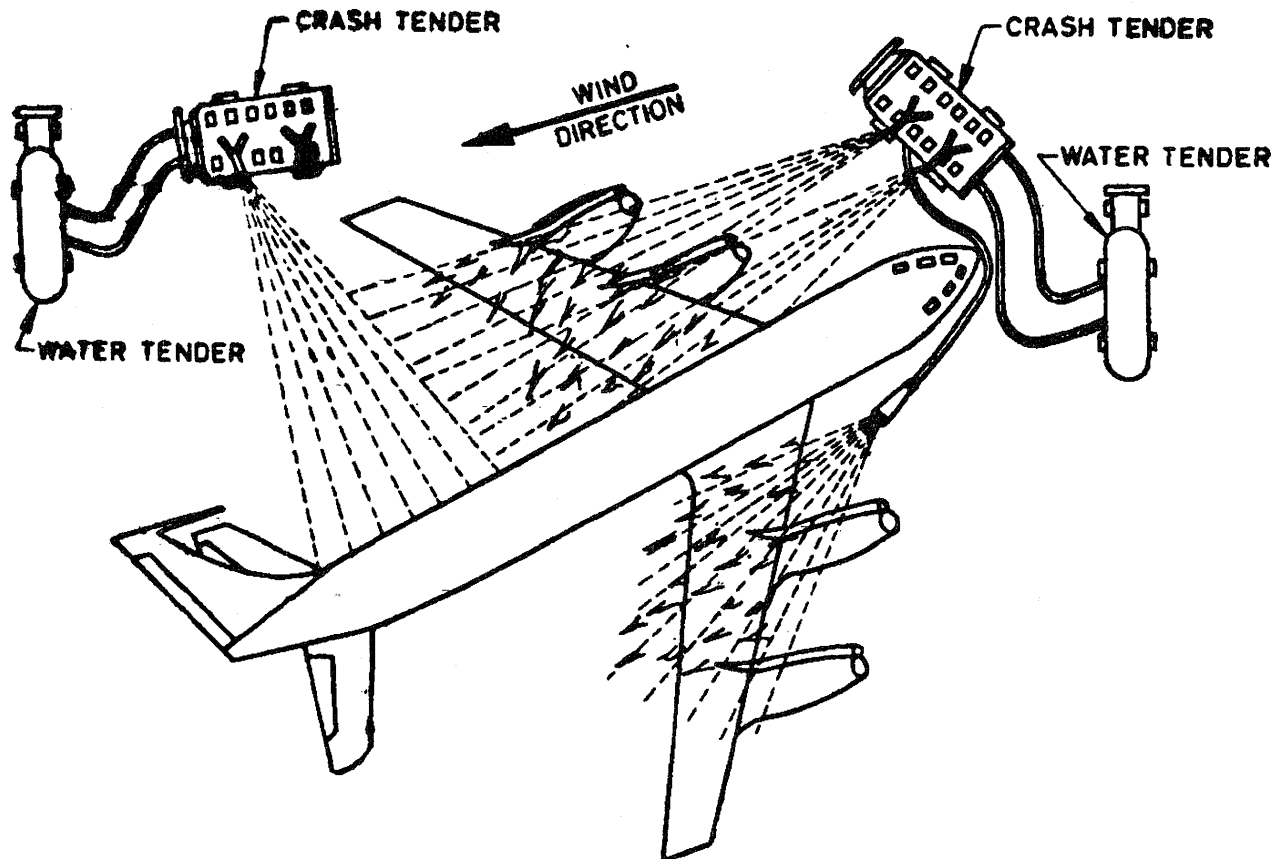


FIG. 3 TYPICAL SKETCH SHOWING CORRECT PARKING OF APPLIANCES IN RELATION TO BURNING AIRCRAFT (TWO FOAM AND CO₂ CRASH TENDERS AND TWO WATER TENDERS)

to cover the fuel spillage near an aircraft with a blanket of foam with a view to prevent an outbreak of fire while normal operations are in progress. When fighting an aircraft or other fire, the appliance shall be parked according to the procedure given in 11.2.4 and the engine shall be kept running. When carrying out the drill, it may be parked as required. In any case, hand brake shall be applied to the appliance before commencing operations, unless it is necessary to move it for the purpose of obtaining a more advantageous position for attacking the fire. The procedure given in 11.3.1 to 11.3.9 shall be followed for producing foam, in the order in which it is given.

NOTE — Foam discharge may also be commenced as the appliance draw into the parking position.

11.3.1 While carrying out a wet drill with engine stopped, the engine shall be started. The engine shall be kept running during 'hot' drills and when attending a fire (*see* 11.3).

11.3.2 The pump shall be engaged according to the instructions of the manufacturer. When the pump is engaged while the appliance is on the move, it shall be done at not more than 700 rev/min of the engine unless the manufacturer directs otherwise in the instruction manual.

11.3.3 The water tank-suction valve shall be opened and the foam-compound rate-of-flow selector valve set at the required position according to the number of deliveries in use.

NOTE 1 — If the appliance is fitted with an automatic foam-compound proportioning device, it may only be necessary to put the regulator in the 'ON' position at the beginning of operations.

NOTE 2 — In case of an aircraft fire, it is advisable to commence the attack with one or both monitor(s) so as to overwhelm the fire with a heavy discharge rate. The monitor(s) may be progressively closed down as the hand-lines are brought into operation for complete extinction of residual fires. The monitor(s) shall not, however, be effective when the crash tender cannot be taken within 25 to 30 m of the burning aircraft. In that case, only hand-lines shall be used. If the distance is beyond the reach of the single length of hose, which is kept connected between the delivery outlet and the foam making branch pipe, more hoses shall be connected up. When this is necessary, only one line shall be got ready and working before attempting to lay out a second delivery line.

11.3.4 In case of the air blown foam system, the compressor shall be engaged whenever the monitor is to be used and disengaged when the monitor is not used or is no longer required.

11.3.5 A pressure of 0.7 MN/m^2 (7 kgf/cm^2) shall be built up on the pump and shall be maintained at this level, as the delivery is opened up by manipulating the throttle.

11.3.6 The delivery monitor or hand-line, as the case may be, shall be opened and the foam applied to the fire or spillage as necessary.

11.3.7 While changing from monitor to sideline, the foam-compound rate-of-flow selector valve setting shall be suitably altered, unless the appliance is fitted with automatic foam proportioning device.

11.3.8 Where the fire situation requires the use of foam having greater adhesion, it may be obtained either by moving the foam-compound rate-of-flow selector valve to one setting higher than the one normally required, or, to a limited extent, by increasing the delivery pressure at the pump.

11.3.9 At close of operations, the used delivery hoses and foam making equipment, including all plumbing through which the water foam-compound solution flows during foam production, shall be thoroughly flushed out with clean water in accordance with the instructions on the 'flushing out instruction plate' on the pump operating control panels. The foam-compound tank shall then be topped up, unless it is due for cleaning [see Table 1 and 13.4 (a)].

11.4 Production of Foam and Delivery of Foam-Fog, Taking Water from the Service Tank of the Crash Tender — This operation may be necessitated when it is necessary to cool down the wings or fuselage of a burning aircraft or similar overheated surfaces, in case of other

petroleum fires, simultaneously with the fire fighting operations by a single appliance, or while carrying out a wet drill. The procedure given in **11.4.1** to **11.4.4** shall be followed.

11.4.1 The appliance shall be positioned as given in **11.2.4** and the instructions given in **11.3** to **11.3.6** shall be carried out for discharging foam through one monitor only.

11.4.2 Delivery hose shall be run out from one of the pump deliveries and the foam branch at its end shall be replaced by a fognozzle, with or without applicator, as required.

11.4.3 The foam-compound rate-of-flow selector valve setting shall be changed to one stage higher than the one required for operating a single monitor, and the hand-line having the fognozzle at its end shall be opened up.

11.4.4 At close of operations, the instructions given in **11.3.9** and **13.4 (a)** shall be carried out.

11.5 Delivery of Water Jets or Water-Fog, Taking Water from the Service Tank of the Crash Tender—This operation may be necessitated for washing down spilled or burning fuel from under an aircraft, when such spillage is over a built up ground and there is no danger of the fuel wash causing a hazard of fire or explosion elsewhere, or for fighting Class 'A' fires (*see* IS:2190-1962*) or for cooling down, or while carrying out a wet drill. The procedures given in **11.5.1** to **11.5.4** shall be followed.

11.5.1 The appliance shall be suitably positioned. In case of a burning fuel spillage under an aircraft, the instructions given in **11.2.4** shall apply.

11.5.2 With the engine running, the pump shall be engaged according to the manufacturer's instructions. When the pump is engaged while the appliance is on the move, it shall be done at not more than 700 rev/min of the engine unless the manufacturer has stated otherwise in the instruction manual.

11.5.3 Necessary hose line(s) shall be laid out from the pump outlets and branch pipe(s), with required size of fognozzles or fognozzle shall be connected as necessary.

NOTE — The fognozzle has the advantage that it can produce a straight jet or water-fog at the flick of a handle, but the size of jet cannot be changed.

11.5.4 The pump delivery outlets in use shall be opened after building up adequate pressure at the pump. The actual pressure will depend upon the size of nozzle(s) in use.

*Code of practice for selection, installation and maintenance of first-aid fire appliances.

TABLE 1 WEEKLY MAINTENANCE ROUTINE TO BE CARRIED OUT AT THE FIRE STATION*(Clauses 11.3.9, 13.2 and 13.3)*

DAY OF WEEK	DETAILS OF TASK
Monday	a) All nipples, cross shafts, valve spindles, etc, shall be lubricated with grease gun, oil can or by hand as required b) Radio telephone shall be checked, tested and cleaned by a qualified technician
Tuesday	Foam production test shall be carried out, discharging foam through monitor and side lines for 15 seconds each. For the purpose of this test, the foam branches shall be fitted directly to the pump outlets. The flushing out operations and replenishment shall be carried out after the test in accordance with instructions given in 13.4 (a)
Wednesday	a) All locker doors, hinges, cab doors, bonnet hinges and catches shall be lubricated using light machine oil b) Search and spot lights shall be checked for free movement and lubricated as necessary. Cables shall also be checked at the same time. Fire bells shall be checked for correct operation
Thursday	a) Delivery hoses shall be laid out for airing and all hoses shall be replaced with fresh hoses from the stock. After airing, hoses shall be cleaned, made up and kept in store b) Ladders shall be checked. Pawls and pulleys shall be lubricated with light machine oil
Friday	a) CO₂ hose reel tubing shall be spread out and examined for cuts and/or visual defects. It shall be rewound after applying french chalk to it b) All tyres shall be checked for correct inflation and cleaned. Particular attention shall be paid to the presence of stones between the tyre treads and mud between the twin rear tyres
Saturday	a) First-aid hose reel tubing shall be checked and treated with french chalk as for CO₂ hose-reel tubing (see Friday) b) Engine shall be cleaned c) All hoses on the appliance shall be replaced with fresh hoses and the ones which are removed shall be tested. All defective hoses shall be repaired after drying and before being stowed away
Sunday	Weekly summaries shall be entered in the vehicle history book and records shall be completed

11.6 Using the First-Aid Hose-Reel only, Taking Water from the Service Tank of the Crash Tender—This operation may be necessitated when fighting Class 'A' fires (*see* IS:2190-1962*) where indiscriminate use of water is likely to cause water damage or where the size of fire is so small that it does not warrant the use of full sized jets. It may also be useful for producing the desired effect on the public by getting a jet to work within a couple of seconds of the arrival of the crash tender at the scene of fire—particularly a building fire—and till the larger jets could be got to work.

11.6.1 The appliance shall be parked and instructions given in 11.5.2 shall be carried out. A pressure of 0.7 MN/m^2 (7 kgf/cm^2) shall then be built up at the pump and shall be maintained at this level. The required length of hose-reel tubing shall be pulled out, the hand controlled nozzle shall be opened and the jet directed at the fire.

11.7 Continuing Any of the Operations, Given in 11.3 to 11.6 Without Interruption, Taking Water from the Water Tender—This operation may be necessitated in case of an aircraft crash fire away from the hangar or apron when it may be necessary to augment the water supply normally carried on the crash tender in order to ensure that the fire fighting operations could be prolonged without interruption or while carrying out a wet drill. It may also be employed in fighting Class 'A' fires (*see* IS:2190-1962*) if the utilization of static water supply is likely to be delayed.

11.7.1 The crash tender shall be operated in the normal manner according to the applicable instructions given in 11.3 to 11.6.

NOTE—In crash tenders fitted with heat exchanger, the by-pass to the heat exchanger shall be opened and when the crash tender is used for foam production, the heat exchanger circuit shall also be thoroughly flushed with clean water at the close of operations.

11.7.2 Simultaneously, the water tender Type X conforming to 'Indian Standard specification for water tender, Type X, for fire brigade use' (*under preparation*), shall be positioned close to it, say at approximately 25 m, and the hoses from the four pump deliveries of the water tender shall be connected to the four hydrant connections on the crash tender.

NOTE—Until the standard under preparation is published, the matter shall be subject to the agreement between the concerned parties.

11.7.3 The water tender pump shall be operated, taking water from its service tank and the pump deliveries opened. The pressure at the water tender pump shall be adjusted to give adequate rate of discharge to maintain the water level in the crash tender tank constant, which may be read off the water tank contents gauge fitted to the crash tender.

*Code of practice for selection, installation and maintenance of portable first-aid fire appliances.

11.8 Production of Foam, Taking Water from an Open Static Supply—This operation may be necessitated while fighting an aircraft fire in a hangar or on the apron, or while fighting fire in fuel spilled on an apron, or while fighting fire in the oil companies' depots at the aerodrome, when the fire fighting operations have to be prolonged beyond the capacity of the available appliance(s), or while carrying out a wet drill.

11.8.1 The crash tender shall be positioned at the static water supply and necessary lengths of suction hose connected up with the strainer attached to the last length. The suction hose shall be secured with a rope and its strainer and lowered into the water.

11.8.2 The pump shall be engaged and primed with the engine running in accordance with the manufacturer's instructions.

NOTE—In crash tenders fitted with heat exchanger, the by-pass to the heat exchanger shall be opened as soon as the pump has primed and the heat exchanger circuit shall also be thoroughly flushed with clean water at the close of operations.

11.8.3 The foam-compound rate-of-flow selector valve shall be set at the required position according to the number of deliveries in use (*see* Notes 1 and 2 below 11.3.3).

11.8.4 The instructions given in 11.3.4 to 11.3.9 shall be carried out.

NOTE—When the crash tender has to be operated for long periods, it shall be necessary to replenish its foam-compound tank also. This may be done either by using the transfer pump (*see* 11.12) or by pouring in the foam-compound through the filling orifice of the tank. Alternatively, the foam-compound may be induced direct from the containers through the syphonic pick-up tube.

11.9 Production of Foam and Delivery of Foam-Fog, Taking Water from an Open Static Supply—This operation may be necessitated under circumstances similar to those given in 11.8, when it is necessary to cool down the wings or fuselage of a burning aircraft or similar overheated surfaces, in case of petroleum fires, simultaneously with the fire fighting operations by a single appliance.

11.9.1 The instructions given in 11.8.1 to 11.8.4 including notes below 11.8.2 and 11.8.4 shall be carried out, except that only one monitor shall be operated and foam-fog shall be produced as given in 11.4.2 and 11.4.3.

11.10 Delivery of Water Jets of Water-Fog, Taking Water from an Open Static Supply—This operation may be necessitated when under circumstances similar to those given in 11.5, the fire fighting operations have to be prolonged beyond the capacity of the available appliance(s).

11.10.1 The instructions given in 11.8.1 and 11.8.2 shall be carried out followed by instructions given in 11.2.4, 11.5.3 and 11.5.4.

NOTE—In crash tenders fitted with heat exchanger, the by-pass to the heat exchanger shall be opened as soon as the pump has primed.

11.11 Filling the Water Tank of the Crash Tender — The water tank of the crash tender may be filled in two ways:

- a) from an open static water supply, using the crash tender pump; and
- b) from the overhead reservoir (*see* Fig. 1).

11.11.1 While filling up from an open static water supply, using the crash tender pump, the instructions given in **11.8.1** and **11.8.2** shall be carried out.

11.11.1.1 Necessary lengths of hose shall be connected between the pump delivery outlets and the hydrant filling connections of the crash tender.

11.11.1.2 The pump delivery outlets shall be opened and a pressure of not more than 0.05 MN/m^2 (0.5 kgf/cm^2) shall be maintained at the pump till water is seen coming out of the overflow pipes and/or the water tank contents gauge reads 'full'.

NOTE — Manufacturer's special instructions, if any, to ensure that the tank shall not be internally pressurized while filling, shall be carefully followed.

11.11.2 While filling up from the overhead reservoir, the crash tender shall be driven to and positioned below the reservoir outlet in such a manner that the filling orifice of the crash tender tank is under the reservoir outlet. The crash tender water tank filler cap shall be opened, the canvas hose attached to the overhead reservoir outlet shall be put into the filling orifice and the overhead reservoir delivery valve opened. The valve shall be closed as soon as the tank is full, the filler cap on the crash tender tank tightened and the appliance driven away.

11.12 Filling the Foam-Compound Tank of the Crash Tender — The crash tender foam-compound tank may be filled in two ways:

- a) through the foam-compound transfer pump, and
- b) through the filling orifice of the tank.

11.12.1 Filling up the foam-compound tank through the transfer pump has the advantage that it does not cause the foam-compound to froth in the tank. This method should normally be adopted, unless it is necessary to fill the tank rapidly during an emergency.

11.12.1.1 For filling, the syphonic pick-up tube shall be connected to the inlet of the transfer pump and its rigid portion inserted into the foam-compound container.

11.12.1.2 The valve to permit filling of the foam-compound tank shall be opened and the transfer pump operated after ensuring that the filler cap of the tank is open.

11.12.1.3 Pumping shall be stopped as soon as the tank is full, the tank filler cap shall be closed tightly, the syphonic pick-up tube shall be disconnected from the transfer pump and the tank filler valve shall be closed.

11.12.1.4 The transfer pump and the syphonic pick-up tube shall be thoroughly flushed with clean water before making up.

11.12.2 Filling up the foam-compound tank through the filling orifice shall be resorted to only during the emergency.

11.12.2.1 For filling, the filler cap of the tank shall be opened and, after ensuring that the strainer is in its position inside the filling orifice, foam-compound shall be poured in.

11.12.2.2 The filler cap shall be replaced on the foam-compound tank when it is full.

11.13 Discharging Carbon Dioxide Gas for Extinguishing Small Fires—This operation may be necessitated when it is necessary to knock out quickly the residual flames resulting from an aircraft fire, or when it is necessary to fight a fire inside the fuselage of an aircraft when the portable extinguishers are not available or are inadequate, or for injecting carbon dioxide into the aircraft engine or wing on fire, or when carrying out live drills.

11.13.1 For fighting residual fires in the open or for fighting a fire inside the aircraft fuselage, adequate length of carbon dioxide hose-reel tubing, with the discharge horn attached, shall be pulled off the reel and the driver operator shall actuate two carbon dioxide cylinders, either by the 'pull-offs' in the driving cabin or from the cylinder position. This shall be followed up by actuation of one cylinder at a time as and to the extent it is necessary.

11.13.1.1 The gas shall be applied to the fire in short bursts or continuously, as dictated by circumstances.

11.13.2 For injecting the carbon dioxide into the burning engine or wing of the aircraft, the discharge horn shall be replaced by the carbon dioxide extension applicator.

11.13.2.1 In case of an engine, the small horn on the applicator shall be removed by unscrewing and the 'rose' pressed against the carbon dioxide access panel on the engine.

11.13.2.2 In case of wings, a hole shall be made into the skin covering of the wing and the carbon dioxide extension applicator horn placed over it to allow the gas to permeate into the wing spaces. The hole shall be made in the upper surface of the wing.

12. FAULTS

12.1 Mechanical Faults — If instructions given in **13** and **14** are followed carefully and regularly, there should be no major mechanical defect on the fireground. However, minor defects may sometimes occur and the driver-operator should be able to trace the fault and rectify it on the spot.

12.1.1 The driver-operator shall thoroughly study the electrical, fuel and lubrication systems of the engine, with particular reference to the fault-tracing chart, normally given in the instruction manual, till he becomes fully conversant with these.

12.1.2 Mechanical fault may not always be the cause of failure of the engine to start. It may be due to faulty handling also. It is, therefore, essential that the driver-operator is fully familiar with the operating instructions for the vehicle, as supplied by the manufacturer and is given adequate practice in its driving and operation under supervision of a competent person.

12.2 Foam Making and Carbon Dioxide Equipment Faults — Maintenance instructions given in **13**, if carried out scrupulously, should ensure a trouble-free service from the foam making and carbon dioxide equipment. Failure may in that case be due to human error in operation only. In case of failure, the following shall be checked:

- a) If there is no discharge from the monitor(s) or side-line(s), the reason may be:
 - 1) pump not engaged; or
 - 2) water tank-suction valve not open; or
 - 3) in case of pumping from an open static supply, pump not primed; or
 - 4) the delivery outlet control valve(s) for the monitor(s) or side-line(s), as the case may be, is (are) not open.

Each of the above shall be checked in turn and the fault rectified.

- b) If foam does not form or it is of poor quality, the foam-compound rate-of-flow selector valve shall be checked for correct setting.
- c) If carbon dioxide cylinder discharge head operating mechanism does not function, it may be due to non-removal of the safety peg, which shall be checked and removed, if necessary.
- d) If the removal of safety peg also does not bring any satisfactory results, it may be due to non-replacement of empty cylinder(s).
- e) If the carbon dioxide cylinders discharge head operating mechanism function satisfactorily and still no gas comes out of the discharge horn, it may be due to not opening of the carbon dioxide hose-reel main valve or the shut-off valve on the discharge horn. Both shall be checked, beginning at the discharge horn.

12.3 Pump Faults — Centrifugal pump itself is very reliable and shall give trouble-free service throughout the effective life of the appliance. The difficulty may arise only in case of mechanical breakdown of the prime-mover or defect in primer, when taking water from an open static supply, or faulty operation. Almost all operational faults can be detected readily by keeping a careful watch on and correctly interpreting the variations in the reading of the pump gauges, that is, the pump pressure gauge and the compound gauge. In actual practice, there may be innumerable minor faults which should not be difficult for a well trained driver-operator to trace and rectify himself. The interpretation of some commonly encountered variations in the readings on the pump gauges is given in 12.3.1 to 12.3.4.

12.3.1 General (Applicable to All Cases) — The following variations in pump gauge readings may be encountered in all cases where water is pumped through hose lines. The remedy is self evident in each case:

- a) *Sudden increase in the pressure gauge reading* — This may be due to some obstruction in the delivery line, between the pump and the branch. The driver-operator shall immediately reduce pump speed and investigate the cause, unless it can be directly observed that one or more monitor(s) and/or side-line(s) has (have) been shutdown. It may be due to any one of the following:
- 1) Kinks in the delivery hose;
 - 2) Vehicle standing on the hose;
 - 3) Debris of collapsed wall, etc, fallen on hose;
 - 4) Shutting-off of hand controlled branch or changing the discharge pattern of a hand controlled branch from jet to partial spray;
 - 5) Shutting-off of the dividing breeching with control; and
 - 6) While pumping from an open static supply, blockage of the nozzle at the branch by small stone which might have passed through the pump.

NOTE — If (6) is suspected to be the reason, the pump delivery must be shut down and pressure from the hose line relieved by disconnecting an intermediate pair of couplings, before attempting to check or remove the stone. Failure to take this precaution may result in serious injury to the person checking the defect.

- b) *Sudden decrease in the pressure gauge reading* — This may be due to any one of the causes given below (before investigating, the driver-operator shall try to maintain pump pressure by increasing the pump speed):

- 1) Bursting of any of the hoses in the delivery line,
- 2) Delivery hose couplings getting disconnected,

- 3) Opening of a hand controlled branch or changing the discharge pattern of a hand controlled branch from partial spray to jet, and
 - 4) Opening of a dividing breeching with control.
- c) *Pressure gauge needle dropping to zero* — This may be due to the water supply to the pump being cut off, as in the cases given below:
- 1) When taking water from the crash tender tank, the water in the tank may be exhausted;
 - 2) When taking water from a water tender, the water in the water tender tank may be exhausted or the water tender may have stopped delivering water into the crash tender tank; and
 - 3) When taking water from an open static water supply, the water at the source may be exhausted, or the water level may have gone down to below the suction strainer, or any of the faults given in 12.3.4 (a) for failure of pump priming may occur.

12.3.2 *When Taking Water from the Service Tank of the Crash Tender* — The pressure gauge may:

- a) show a sudden increase in pressure reading. For interpretation, *see 12.3.1 (a)*;
- b) show a zero pressure reading. For interpretation, *see 12.3.1 (b)*;
- c) show a zero pressure reading. For interpretation, *see 12.3.1 (c)*; or
- d) show an erratic reading. This is due to the water in the service tank going down to a level where air is sucked into the pump through the water tank and is an indication that the water in the tank is nearing exhaustion.

12.3.3 *When Taking Water from a Water Tender* — The pressure gauge may:

- a) show a sudden increase in pressure reading. For interpretation, *see 12.3.1 (a)*;
- b) show a sudden decrease in pressure reading. For interpretation, *see 12.3.1 (b)*;
- c) show a zero reading. For interpretation, *see 12.3.1 (c) (2)*; or
- d) show an erratic reading. For interpretation, *see 12.3.2 (d)*. A quick check shall be made with the driver-operator of the water tender when this happens and, if there is everything all right with the water tender, the crash tender pump may continue to be operated at reduced speed.

12.3.4 When Taking Water from an Open Static Supply—Some of the common faults may be the following:

a) *Failure of pump to prime*—This may be due to either a leak or an obstruction on the suction side. The compound gauge shall indicate a zero reading in case of a leak and a high vacuum reading in case of an obstruction. When there is a zero reading on the compound gauge, the following shall be checked in the order in which each is given:

- 1) *Suction strainer*—It shall be submerged approximately 450 mm below the surface of the water.
- 2) *Joints between the suction hose and the pump inlet and between the suction hoses, where more than one length is used*—These shall be tight and the washers in female couplings shall be intact and serviceable.
- 3) *Pump casing drain plug, or drain cock, if fitted*—It shall be tightly closed.
- 4) *Pump delivery valves*—These shall be opened and then full closed.
- 5) *Heat exchanger by pass valve*—It shall be closed.
- 6) *Crash tender service tank-suction valve, when the service tank is empty*—It shall be closed.
- 7) *Foam-compound rate-of-flow selector valve, when the foam-compound tank is empty*—It shall be closed.
- 8) *Shut-off cock on compound gauge connection*—It shall be open. Occasionally, a leak may develop in the connection(s) between the pressure and compound gauge and the pump. In that case, it shall be necessary to close down both shut-off cocks and work the pump by other indications, such as change of engine sound when the pump is primed, flow of a constant stream of water through the primer waste pipe, etc.
- 9) Where the primer is not fully automatic, the priming valve may not have been opened.
- 10) Incorrect engine speed in case of fully automatic primers.
- 11) Slow running of engine in case of exhaust ejector, induction and other primers requiring high speed operation.
- 12) Primer not engaged properly.
- 13) Leaking pump gland.
- 14) Air leak in suction hose. Change of suction hose, in which air leak is suspected, is the remedy because air leak in the suction hose cannot be detected or rectified on the spot.

- b) When there is a high vacuum reading on the compound gauge, the following shall be checked in the order in which each is given:
 - 1) Basket strainer, metal strainer and the strainer at the pump inlet. The basket/metal strainer shall not be bogged in mud and none of the strainers shall be checked; and
 - 2) If the strainer(s) is (are) clean, the suction hose(s) shall be changed, because in that case the obstruction could be due to a fault in the internal lining or inner walls of the suction hose which collapses as soon as the primer is operated.
- c) Sudden increase in pressure gauge reading. For interpretation, *see* **12.3.1 (a)**;
- d) Sudden decrease in pressure gauge reading. For interpretation, *see* **12.3.1 (b)**;
- e) Pressure gauge reading dropping to zero. For interpretation, *see* **12.3.1 (c) (3)**; or
- f) Increase in vacuum reading on the compound gauge whilst working — it may be due to any of the following reasons:
 - 1) Drop in the water level at the supply source because of pumping. This is no cause for anxiety, unless the supply is nearing exhaustion.
 - 2) Increase in the rate of delivery of the pump. This is also no cause for anxiety.
 - 3) Partial blocking of the strainer(s). If (1) and (2) are eliminated, the strainer(s) shall be withdrawn and cleaned before recommending pumping. At times, shaking the strainer by the rope attached to it clears it of obstruction.
- g) Decrease in vacuum reading on the compound gauge whilst working — It may be due to any of the following causes:
 - 1) Rise in the water level at the supply source because of the rate of its replenishment being more than the pump off-take; or
 - 2) Decrease in the rate of delivery of the pump, when the rate of replenishment of the static supply remains unaltered.
- h) Erratic reading on the pressure gauge — It is an indication that air is being sucked in from the suction side through the strainer. The suction strainer shall be checked and submerged at least 450 mm below the water level.
- j) Complete loss of vacuum on the compound gauge — It may be due to any of the faults mentioned in **12.3.4 (a)** for zero reading on the compound gauge.

13. MAINTENANCE

13.1 Daily Routine — In addition to the general operating instructions given in 11.2 to 11.2.3, the appliance shall be cleaned thoroughly every day. The following tasks shall be carried out:

- a) The following shall be cleaned and polished to a shine:
 - 1) All painted parts. Soft rags or polishing cloth shall be used. Colourless wax polish shall be applied, if necessary;
 - 2) All unpainted brass, using metal polish and soft rags;
 - 3) All unpainted chromium plated parts, using soap and water and polishing cloth after drying; and
 - 4) All unpainted steel, using kerosene oil and fine grade emery cloth and wiping clean with soft cotton rags.
- b) All scratched paint shall be retouched as necessary with correct shade of good quality paint.
- c) Chafed parts of wooden ladders shall be revarnished.
- d) All dull finished metal parts shall be burnished.
- e) All cutting edges of tools shall be sharpened as necessary and all gear shall be restowed correctly.
- f) Delivery and suction hoses shall be maintained according to the instructions contained in relevant Indian Standards.
- g) Locker doors, hinges, locks, lids and covers on the appliance shall be checked for proper functioning.
- h) All parts of body-work coming in contact with water shall be checked for signs of rust or corrosion and shall be cleaned and repainted as necessary.
- j) All plumbing shall be checked for leaks, and leaks rectified as necessary. It shall be ensured that all pipework is firmly supported. Standing on pipework or control rods and linkage shall be avoided while working in pump compartment.
- k) All CO₂ cylinders and portable fire extinguishers shall be cleaned, polished and retouched with paint of appropriate shade as necessary. The CO₂ cylinders shall be checked to ensure that the cylinder discharge head sealing wire is not broken. The cylinders shall be check-weighed and replaced as necessary, if the sealing wire is found broken.

- m) All drain cocks, monitor outlet valve, foam side-lines and pump outlet valves, water tank — suction valve, foam-compound rate-of-flow selector valve, first-aid and CO₂ hose-reel valves, pump gauge connections isolating cocks and all other lever and wheel type controls and cocks shall be checked to ensure that these are functioning properly and are in the closed position.

NOTE — In case of monitor(s) operated on air-blown-foam system only, the monitor outlet control valve(s) shall be kept in the open position.

- n) The auxiliary throttle on both side panels shall be checked for correct functioning after engaging the pump.
- p) Engine shall be cleaned with rags, using used lubricating oil and kerosene oil mixture in equal parts. Care shall be taken not to disturb connections.
- q) The following shall be lubricated:
 - 1) Centrifugal pump; and
 - 2) Valve spindle, including pump outlet valves, all lever type valves and linkages, auxiliary throttle.

13.2 Weekly Routine — In addition to the general operating instructions given in 11.2 to 11.2.3 and the daily routine maintenance instructions given in 13.1, the tasks shown in Table 1 shall be carried out, as applicable, at the fire station, once a week.

13.3 Monthly Routine — The maintenance given in Table 2 shall be carried out at the fire station or at the workshop as stated in the table. These shall be in addition to the general operating instructions given in 11.2 to 11.4, daily routine maintenance tasks given in 13.1 and weekly routine maintenance tasks given in Table 1.

13.4 After Use — Immediately after returning from a fire and after using the crash tender for live drills or testing, the following instructions shall be carried out:

- a) After foam production:
 - 1) the foam-compound tank shall be drained out ;
 - 2) the pump, foam-compound tank, all plumbing and fittings between the foam-compound tank and the pump, all hoses used for the foam discharge, foam monitor(s) if used, foam making branch(es) if used and heat exchanger circuit if used, shall be thoroughly flushed out, cleaned and dried. All used hoses shall be replenished with fresh hoses from the store ;
 - 3) the water tank, the radiator tank and the fuel tank shall be replenished ;

TABLE 2 MONTHLY MAINTENANCE ROUTINE TO BE CARRIED OUT AT THE FIRE STATION OR WORKSHOP

(Clause 13.3)

SL No.	TASK	WHERE TO BE CARRIED OUT	DETAILS OF TASK
(1)	(2)	(3)	(4)
i)	Fire fighting equipment	Fire station	Monthly output test of the pump shall be carried out according to the instructions given in 14.1.2 (a) Once in six months the deep-lift test shall also be carried out in accordance with the instructions given in 14.1.2 (c) Vacuum test shall be carried out for the pump according to the instructions given in 14.1.2 (b) and for the suction hoses according to the instructions given in 14.1.3 Where air blown foam equipment is fitted, the air blower shall be cleaned and serviced The foam-compound transfer pump shall be tested and serviced All CO₂ cylinders shall be check-weighed. Once in six months, the CO₂ hose-reel tubing shall be tested against a hydraulic pressure of 7 MN/m² (70 kgf/cm²). The first-aid hose-reel tubing shall be subjected to a pressure test of 1.05 MN/m² (10.5 kgf/cm²) for 2½ minutes
ii)	Body work	Workshop	All body bolts and screws shall be checked and tightened as necessary. At the same time, necessary repairs shall also be carried out All lockers shall be checked for signs of rust and corrosion and cleaned and repainted as necessary. All locker hinges and catches shall also be checked at the same time. All foam-compound pipe connections shall be opened, cleaned and refitted, making sure that all connections are correctly made and are tight.

- 4) the foam-compound tank shall be refilled to full capacity;
 - 5) lubricating oil level in the engine sump shall be checked and topped up, if necessary ;
 - 6) heat exchanger by-pass filter shall be cleaned when the heat exchanger has been used ;
 - 7) in case of reciprocating primer, water in the primer sump shall be allowed to settle and then drained out if the primer has actually been used. The primer crank case shall always be kept topped up with lubricating oil ; and
 - 8) in case of rotary primer, it shall be run for a short time to eject all water. It shall then be lubricated and turned by hand.
- b) After pumping water only:
- 1) the pump shall be thoroughly flushed with clean water and all used hoses shall be flushed, cleaned and dried. Hoses shall be replenished with fresh hoses;
 - 2) the water tank, the radiator tank and fuel tank shall be replenished ;
 - 3) lubricating oil level in the sump shall be checked and topped up, if necessary ;
 - 4) heat exchanger by-pass filter shall be cleaned when the heat exchanger has been used;
 - 5) in case of reciprocating primer, water in the primer sump shall be allowed to settle and then drained out if the primer has actually been used. The sump of the primer shall always be kept topped up with lubricating oil ; and
 - 6) in case of rotary primer, it shall be run for a short time to eject all water. It shall then be lubricated and turned by hand.
- c) After discharging carbon dioxide:
- 1) the radiator tank and fuel tank shall be replenished if the appliance had gone out ;
 - 2) lubricating oil level in the engine sump shall be checked and topped up as necessary if the appliance had gone out ; and
 - 3) used carbon dioxide cylinders shall be replaced with fully charged once after check-weighing the charged cylinders, and the cylinders shall be connected up to the cylinder head operating mechanism, both at the remote control and cylinder positions. The safety pegs shall be removed from each cylinder head after connections are completed.
- d) In all cases, the appliance, including the ancillary equipment, shall be thoroughly cleaned and polished as necessary.

14. TESTING

14.1 Periodical tests of equipment fitted/carried on the foam and CO₂ crash tender shall be carried out as given in 14.1.1 to 14.1.4.

14.1.1 Ancillary Equipment—Ancillary equipment shall be tested in accordance with the relevant Indian Standard.

14.1.2 Pump—The pump shall be subjected to the tests given below:

- a) *Monthly output test*—The pump shall be operated for not less than 15 min from an open static water supply with a suction lift of 3 m. Three deliveries shall be used for discharging water, each through 30 m of rubber lined hose, conforming to IS:636-1962*, and 25 mm nozzle, at a pressure of 0.6 MN/m² (6 kgf/cm²). The branches shall be lashed if required. If the pump fails to sustain a pressure of 0.6 MN/m² (6 kgf/cm²) for the full 15 min, the reason shall be investigated and rectified at the workshop. The pump gland shall be checked for excessive leakage, if necessary, at the same time.

NOTE—While adjusting the pump gland, care shall be taken to ensure that water does not cease to drip when the pump is working under pressure. It is advisable to make the adjustment with the pump working at a pressure of 0.7 MN/m² (7 kgf/cm²). A drip of 30 drops per minute shall be allowed.

- b) *Monthly vacuum test*—This test shall be carried out immediately after the test given in 14.1.2 (a). The suction blank cap shall be tightened on the suction inlet of the pump after ensuring that its washer is intact and serviceable. All blank caps from the pump delivery outlets shall be removed. With the compound gauge cock fully open, the primer shall be operated for 45 seconds or till a vacuum of 600 mm (Hg) is obtained, whichever is earlier. The priming shall then be stopped and the compound gauge needle watched. If it falls back to 250 mm (Hg) in less than one minute, it is an indication that an excessive leak is present and it shall be looked into. The excessive leak may be due to:

- 1) loose or defective pump glands,
- 2) leakage in the pump gauge connections,
- 3) leakage in the delivery outlet valves, or
- 4) leakage in the heat exchanger valve.

- c) *Six monthly deep lift test*—This test shall be carried out once in six months in the same manner as given in 14.1.2 (a) except that only 1 × 25 mm nozzle shall be used and the pump shall maintain a pressure of 0.6 MN/m² (6 kgf/cm²) for 15 minutes with a suction lift of 7.0 m.

*Specification for fire fighting hose (rubber lined, woven-jacketed) (revised).

14.1.3 Suction Hose — The suction hoses shall be tested immediately after the vacuum test given in 14.1.2 (b). If the pump performance is found satisfactory during the vacuum test, all lengths of suction hoses shall be connected to the pump and the blank cap tightened at the end of the last length. The vacuum test shall then be repeated. If excessive leak is detected, all lengths of suction shall be connected individually or together, either to a pump delivery or to a hydrant and subjected to an internal pressure of not more than 0.3 MN/m^2 (3 kgf/cm^2). Any leak present will be visible by the water spurting out of the suction hose.

14.1.4 Carbon Dioxide Equipment — All carbon dioxide cylinders shall be weighed once a month. If there is a loss of more than ten percent of the contents in any cylinder, it shall be replaced with a fully charged one.

14.1.4.1 Once in six months, the carbon dioxide hose-reel tubing shall be subjected to a hydraulic pressure test of 7 MN/m^2 (70 kgf/cm^2) for $2\frac{1}{2}$ minutes.

A P P E N D I X A

(*Clauses 2.1 and 4.2*)

TYPES OF AIRCRAFT EMERGENCY

A-1. DETAILS

A-1.1 Any of the emergencies given in A-1.1.1 to A-1.1.4 concerning aircraft may arise at an aerodrome during the course of operations.

A-1.1.1 Visibility of Weather Standby — This emergency shall be declared by the officer on duty in the aerodrome control tower when it is unavoidable for an aircraft to land at the aerodrome under poor visibility or bad weather (heavy rain, gusty winds, storm, etc) conditions.

NOTE — 'Poor visibility' means that the visibility has deteriorated to such an extent that landing of aircraft may be difficult or difficult to observe.

A-1.1.2 Local Standby — The officer on duty in the aerodrome control tower shall declare this emergency when an incoming aircraft is known or suspected to have developed some defect but the trouble is not such as would normally involve any serious difficulty affecting a safe landing.

A-1.1.3 Full Emergency — When an aircraft coming into land at the aerodrome is known or suspected to be in such trouble that there is danger of an accident, the officer on duty in the aerodrome control tower shall declare 'full emergency'.

A-1.1.4 Aircraft Accident — This includes all accidents to or fires in aircraft on the ground and includes those in parked aircraft.

APPENDIX B

(Clause 3.1)

SCALE OF CRASH TENDERS FOR EACH CATEGORY OF AERODROMES

B-1. DETAILS OF SCALE

B-1.1 Aerodromes are classified under eleven categories (Category I to Category XI), from the point of view of fire risk, according to the recommendations of the International Civil Aviation Organization. The number of crash tenders conforming to IS:951-1969* required for each category of aerodrome is given below:

AERODROME CATEGORY	NUMBER OF CRASH TENDERS REQUIRED
I	One
II	One
III	One
IV	Two
V	Two
VI	Three
VII	Three
VIII	Four
IX	Five
X†	Seven

B-1.2 For Category XI aerodromes, crash tenders made to the Indian Standard shall not be economical to use and larger capacity crash tenders shall have to be provided.

*Specification for combined foam and CO₂ crash tender (*first revision*).

†It may be more economical to provide crash tenders of larger capacity than the ones covered by the Indian Standard for these aerodromes.